

Amendments to the Drawings

Please replace Fig. 1 of the application with the amended figure reflected on the attached Replacement Sheet. Fig. 1 is amended to include superconducting windings in the form of a labeled representation, i.e., a labeled rectangular box.

Attachment: Replacement Sheet

REMARKS

Reconsideration and allowance are respectfully requested. Claims 1-9 and 11-13 remain pending, wherein claims 1, 3-5, 8, 11, and 12 are amended. Entry of these amendments is appropriate in the period after a final rejection because these amendments address the indefiniteness rejection under 35 U.S.C. § 112, second paragraph, and thus reduce issues for appeal and place the application in condition for allowance.

The drawings are objected to as not showing the superconducting windings recited in claim 7. Superconducting windings within a cryostat were generally well-known in the art at the time of the invention and their detailed illustration is not essential to proper understanding of the invention. Accordingly, consistent with 37 C.F.R. § 1.83(a), it is proposed to amend Fig. 1 so that the superconducting windings are “illustrated in the drawing in the form of ... a labeled representation (e.g., a labeled rectangular box).” It should be recognized that this amended figure includes a labeled rectangular box that represents the well-known superconducting windings within a cryostat, but does not necessarily reflect the actual geometry of such an arrangement, which is not required by 37 C.F.R. § 1.83(a). Thus, withdrawal of the objection to the drawings is respectfully requested.

Claims 1-9 and 11-13 are rejected for indefiniteness under 35 U.S.C. § 112, second paragraph. This ground of rejection is respectfully traversed.

The Office Action rejects claims 1, 8, 11, and 12 for reciting that “the thermal interface is the exclusive thermal interface between the refrigerator and the wall of the closed recondensing chamber.” Although it is respectfully submitted that this feature does not render these claims indefinite, these claims are amended consistent with the discussion in the Office Action. Thus, the Office Action states that “the recitation limits the invention to not have any mechanical thermal interface between the refrigerator and the wall shared between

the closed recondensing chamber and the second recondensing chamber or cryogen vessel, rather only the cryogen gas thermally links the two structures together.”¹ Accordingly, consistent with this statement in the Office Action, claim 1 is amended as follows:

the thermal interface is a non-contact thermal interface between a cooling stage of the refrigerator and a base of a closed recondensing chamber and consists of a gas held in thermal contact with [[a]] the cooling stage surface of the refrigerator, and the base of the ~~within a closed recondensing chamber;~~

the cryogen vessel is cooled by thermal conduction through the base ~~a wall~~ of the closed recondensing chamber; and

the cooling stage does not make mechanical contact with the base of the closed recondensing chamber. ~~the thermal interface is the exclusive thermal interface between the.~~

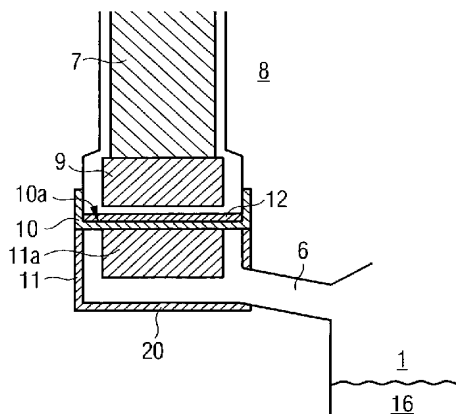
Because this amendment addresses the indefiniteness rejection and is consistent with the discussion in the Office Action as to the meaning of the canceled claim element, this amendment should be entered as reducing issues for appeal and placing the claim in immediate condition for allowance. Independent claims 8, 11, and 12 are amended in a similar manner, and thus the indefiniteness rejection of these claims should be withdrawn and the amendments of these claims should be entered for similar reasons to those discussed above with regard to independent claim 1. Accordingly, the indefiniteness rejection of claims 1-9 and 11-13 should be withdrawn.

Claims 1-9 and 11-13 are rejected for obviousness under 35 U.S.C. § 103(a) in view of the combination of U.S. Patent No. 5,918,470 to Xu et al. (“Xu”) and U.S. Patent No. 4,802,345 to Curtis (“Curtis”). This ground of rejection is respectfully traversed.

The combination of Xu and Curtis does not render independent claim 1 obvious because the combination does not disclose or suggest a cooling apparatus that includes a dual

¹ Page 3.

recondenser configuration arranged such that the thermal interface in both chambers is a non-contact recondensing arrangement. These features are reflected in claim 1 in that “the thermal interface is a non-contact thermal interface between a cooling stage of the refrigerator and a base of a closed recondensing chamber and consists of a gas held in thermal contact with the cooling stage of the refrigerator, and the base of the closed recondensing chamber ... the cryogen vessel is cooled by thermal conduction through the base of the closed recondensing chamber ... and the cooling stage does not make mechanical contact with the base of the closed recondensing chamber.” An example of this non-contact dual condenser arrangement can be seen in Fig. 2 of the present application (a portion of which is reproduced below), in which refrigerator cooling stage 9 is not in mechanical contact with base 10 of closed recondensing chamber 11, but uses a gas held in thermal contact with base 10 to cool the base.



As previously discussed, Xu employs an iridium thermal interface gasket 29 as a thermal interface to recondenser 39. Thus, Xu does not disclose a dual recondenser arrangement in which the thermal interface of both chambers is a non-contact recondensing arrangement.

Curtis discloses a non-temperature cycling cryogenic cooler with a trace amount of noncondensable gas arranged in a space 18 between dewar 14 and cold finger 12.

Specifically, Curtis discusses that prior systems provided air in the space between dewar 14 and cold finger 12, which could result in temperature cycling, and that this is addressed by Curtis by providing “sufficient neon to act as a thermal conductor.”² Curtis, however, does not disclose or suggest a non-contact dual recondenser arrangement as recited in claim 1, and thus the combination of Xu and Curtis does not render claim 1 obvious.

Furthermore, one skilled in the art would not have combined Xu and Curtis to arrive at the dual recondenser arrangement of claim 1. Specifically, Xu relies upon a mechanical contact using an iridium washer between the refrigerator and the thermal interface and Curtis is directed to problems when there is no mechanical interface. Thus, one skilled in the art would not have looked to Curtis to modify Xu because Curtis is directed to problems where there is no mechanical interface and such problems do not exist in Xu because it employs a mechanical interface.

Nevertheless, the Office Action states that it would have been obvious to modify Xu by Curtis because doing so would have “more uniformly cool[ed] the wall of the recondensing chamber.”³ The uniform cooling of Curtis, however, is achieved when there is no mechanical interface and there is no evidence that the arrangement of Curtis would provide more uniform cooling compared to the iridium washer arrangement disclosed by Xu. Thus, there is insufficient evidence in the record to conclude that one skilled in the art would have been motivated to combine Xu and Curtis for the reasons set forth in the Office Action, and accordingly claim 1 is not obvious for this additional reason.

Independent claims 8, 11, and 12 recite similar elements to those discussed above with regard to independent claim 1, and are patentably distinguishable over the combination of Xu and Curtis for similar reasons. Claims 2-7, 9, and 13 are patentably distinguishable at

² Column 1, lines 63-64.

³ Page 6.

least by virtue of their dependency. Accordingly, it is respectfully requested that the rejection of claims 1-9 and 11-13 for obviousness in view of the combination of Xu and Curtis should be withdrawn.

If there are any questions regarding this response or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323, Docket No. 038817.58287US.

Respectfully submitted,

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